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FINAL REPORT

OF THE

HYDROELECTRIC COMMISSION OF OREGON

ON THE ADVISABILITY OF CREATING THE

WICKIUP PEOPLES' UTILITY DISTRICT

SALEM, OREGON

JAN. 10, 1935

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Oregon. Hydroelectric commission

Final report...

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FINAL REPORT OF THE HYDROELECTRIC COMMISSION OF OREGON ON THE ADVISABILITY OF CREATING THE WICKIUP PEOPLES' UTILITY DISTRICT

January 10,1935

INTRODUCTION

The proposed Wickiup Peoples' Utility District is in Clatsop County, Oregon, just east of the city of Astoria. Proceedings to form the district were initiated by the filing of voters' preliminary petitions with the Hydroelectric Commission on August 6, 1934, under the provisions of Chapter 279, Oregon Laws 1931 as amended by Chapter 272 Oregon Laws 1933, known as the Peoples' Utility District law.

The purpose of forming such district as stated in the voters' preliminary petitions is "the acquisition and/or construction of power and light facilities for the generation, transmission, distribution and sale of self-generated and/or purchased electrical energy to residential, commercial, industrial, agricultural and general consumers."

Following the filing of petitions, a preliminary investigation of the project was made by the Commission and a report prepared. On September 14, 1934 a public hearing was

held within the district as provided by law, and the report of the Commission's preliminary investigation was read and filed with the sponsors.

This report is prepared by the Hydroelectric Commission of Oregon in accordance with the provisions of Section 6 of said Peoples' Utility District Law which reads in part as follows. The hearing to which reference is made in the first sentence of the quotation is the hearing held on September 14th.

> "Within 120 days after the close of said hearing, the commission shall make its final report to the sponsors on the advisability of creating the district, or the annexation of territory to an existing district, or the consolidation of two or more districts, and on any other matters contained in said petitions, which said report shall be made a public document. If, after such final report, the sponsors of such petition desire to proceed with the creation of the proposed district, or the annexation of territory to an existing district, or the consolidation of two or more districts, or with regard to any other matters set forth in said petition, such sponsors may within two years from date of said final report file a voters' final petition with the commission, and thereupon said commission forthwith shall examine such petition, and if it is found to

comply with the provisions of this act, call an election to be held not less than 50 days and not more than 60 days thereafter, within the boundaries of the parcel of territory or municipality described in said petition.* * *"

General Description of Proposed District

This proposed district embraces an area of approximately 50 square miles, lying along the main state highway between Portland and Astoria, and extending easterly from the eastern boundary of the city of Astoria a distance of approximately 14 miles. For the most part, the northern boundary follows the south meander line of the Columbia River and the south boundary is a broken line following section lines and sub-divisional section lines so as to take in most of the farming lands lying between the Columbia River and the mountainous territory to the south. The boundaries include the unincorporated communities of Fern Hill, Burnsides' Astoria, Svensen, Knappa and Brownsmead. They include most of the territory now served with electrical energy by the Knappa-Svensen Electric Company.

The topography of most of the area is hilly, the principal exception being diked and tide lands along the Columbia River. Most of this is in the Brownsmead country in the northeastern part of the district.

A considerable portion of the area is timbered but the greatest part is logged-off or burned over land.

The principal industries are farming, dairying, chicken raising and commercial fishing.

Scope of Study

Studies made by the Commission in order to report upon the advisability of creating the proposed district have included the following:

1. The population and assessed valuation of the territory.
2. A study of the records of the Pacific Power and Light Company at Astoria to determine the amount of power now being sold to the Knappa-Svensen Electric Company, which serves this territory, and the charge for such electricity.
3. Market for electrical energy.
4. A survey of Big Creek which flows northerly to the Columbia River through the central portion of the district to determine its possibilities as a source of power for this territory. This included a traverse of the stream and of the Crossett Western Logging Company Railroad which parallels the creek, and the running of wye levels to determine the profile of the creek and the head available. Measurements of the stream flow were also made and daily gage readings obtained through the extreme low water period of 1934.

5. Estimates of cost of a hydro-generating plant located on Big Creek and of a complete transmission and distribution system to serve the territory.

6. A complete log of all the roads and highways within the district made by automobile for the purpose of determining the length of such roads as well as the number and location of all of the residences.

7. An aerial survey of the territory from which a photographic map was prepared showing the location of all roads, houses, and other features, this map being used for the purpose of laying out and estimating the cost of transmission and distribution system.

8. Estimated annual cost of operating a publicly owned electrical system and retirement of the indebtedness which would be created.

In the following pages under appropriate headings will be found the results of the investigations made and the conclusions of the Commission upon the advisability of creating the district.

POPULATION

There has been no actual census to determine the population of this territory, but a study was made for the Commission's preliminary report, dated September 14, 1934. An estimate was made for that report based upon the number of school children within the district boundaries, and also upon the number of registered voters.

Briefly stated, these studies indicated the population to be somewhere between 1,200 and 1,600. Subsequent studies made for this report have indicated that the latter figure is probably more nearly correct. There are about 435 occupied residences. On an average of four persons to the family, the population would be a little over 1,700. It has been noted in the annual report of the Knappa-Svensen Electric Company to the Utilities Commissioner of Oregon, the population of the territory is estimated as 1,650.

In order to arrive at some sort of an estimate of the probable future growth in population, we have compiled some census figures of Clatsop County, showing the past growth of the county as a whole; of the incorporated cities within the county, and of the rural territory. These figures show that the county's population increased from 10,016 in 1890 to 23,030 in 1920 and dropped off to 21,124 in 1930; population of the cities in the county increased from 6,184 in 1890 to 17,233 in 1920 and dropped off to 12,966 in 1930; and the population of rural territory in the county increased from 3,832 in 1890 to 8,158 in 1930. The decreases between 1920 and 1930 may be attributed to the Astoria fire which occurred in 1922.

On Plate A following is shown graphically the growth of population, indicating that from 1890 to 1930 the average growth in Clatsop County was 1.9 per cent compounded annually. At this same rate, the population would reach 51,000 by 1950. The average rate of growth in rural territory in Clatsop County from 1890 to 1930 was also 1.9 per cent compounded annually. At this rate of growth, the population of all rural territory in this county would reach 12,000 by 1950.

Assuming the present population of the district at 1,600 and applying the same rate of growth as has been shown by the population of rural territory in Clatsop County, the district's population would be approximately 1,800 in 1940 and 2,200 in 1950.

ASSESSED VALUATION

Mr. G. W. Spicer, Assessor of Clatsop County, has furnished the Commission an estimate of the assessed valuation of all property within the district assessable for state and county purposes. He estimates the assessed valuation of real property exclusive of public utilities as $425,183, and the assessed valuation of real and personal property including public utilities, $405,000. The total of these figures is $830,183, which may be taken as a fair estimate of the assessed valuation for state and county purposes.

PROPOSED

WICKIUP PEOPLES' UTILITY DISTRICT

GROWTH OF POPULATION
CLATSOP COUNTY

1,000,000
100,000
10,000
1000

1890
1900
1910
1920
1930
1940
1950

Oregon

Clatsop County
1.8% Compounded Annually

Cities and Towns in Clatsop County
1.8% Compounded Annually

Rural Territory in Clatsop County

PLATE A

PRESENT ELECTRICAL SERVICE

The Knappa-Svensen Electric Company, a public utility corporation, now supplies electricity to about 240 of the 437 potential customers of the district as shown by a survey made by automobile. According to a statement of Mr. F. C. Green, representing the company, the number of customers in May, 1934 was 225. Using Mr. Green's figures, the percentage of potential customers being served is about 52. Somewhere between 52 and 55 per cent, say 54, seems a reasonable figure.

This company purchases power from the Pacific Power and Light Company at Astoria. Energy is delivered to said Knappa-Svensen Electric Company through a 50 kv-a, 2300 volt-6900 volt transformer located at the intersection of 54th and Cedar Streets in Astoria.

Energy is purchased by said company under a five-year contract which became effective February 1, 1931. This contract provides a charge of $3.00 per horsepower per month or $36.00 per horsepower per year, based upon the maximum demand, with a minimum charge of $150.00 per month. The maximum demand is determined as the highest horsepower for any 15 minute period. Charges for such energy are computed and rendered monthly as the product of $3.00 a month and the highest maximum demand of the Knappa-Svensen Company occurring in any one month during the twelve month period immediately prior to the date of billing, subject to said minimum provision of $150 per month.

The following table furnished by the Pacific Power and Light Company shows the billing demands in kilowatts and horsepower, the kilowatt hours used, and the amount billed from September 1927 when the Knappa-Svensen Company began operations to and including July, 1934. These figures are arranged for the complete calendar years of 1928 to 1933 inclusive, and on the basis of the total kilowatt hours used and total amount billed for these years, the average cost per kilowatt hour for each year has been computed. These figures ranging from 2.61¢ in 1928 downward to 1.66¢ in 1933 were not furnished by the Pacific Power and Light Company but were added to the table for this report. The computations are obvious.

KNAPPA-SVENSEN ELECTRIC COMPANY
STATEMENT OF POWER BILLING

Showing Kilowatt Hours, Amount Billed, Demands Established and Billing Demand by Months from September 1927 to and including July 1934.

Month	Billing Demands Kw	Hp	Kilowatt Hours Used	Amount Billed	Cost Per Kwh
September 1927	25.0	33.5	900	$ 67.37	
October	25.0	33.5	Min.	41.87	
November	25.0	33.5	4,020	112.07	
December	25.0	33.5	3,240	104.27	
			8,160	$325.58	—
January 1928	25.0	33.5	4,220	114.07	
February	25.0	33.5	3,700	108.87	
March	25.0	33.5	4,260	114.47	
April	25.0	33.5	3,740	109.27	
May	25.0	33.5	3,420	106.07	
June	25.0	33.5	3,360	105.47	
July	25.0	33.5	3,520	107.07	
August	25.0	33.5	3,980	111.67	
September	25.0	33.5	4,380	115.67	
October	26.0	34.85	5,440	128.16	
November	26.0	34.85	6,160	136.36	
December	26.0	34.85	7,180	134.46	
			53,360	$1,391.61	.261

KNAPPA-SVENSEN ELECTRIC COMPANY
STATEMENT OF POWER BILLING

Showing Kilowatt Hours, Amount Billed, Demands Established and Billing Demand by Months from September 1927 to and including July 1934.

Month	Billing Demands Kw	Hp	Kilowatt Hours Used	Amount Billed	Cost Per Kwh
January 1929	26.0	34.85	7,540	$ 139.76	
February	26.0	34.85	6,060	132.36	
March	26.0	34.85	5,760	130.86	
April	27.0	36.19	5,040	128.04	
May	26.0	34.85	4,780	122.56	
June	25.0	33.5	5,600	93.50	
July	25.0	33.5	5,000	121.87	
August	28.0	37.53	5,840	138.91	
September	31.0	41.55	5,600	145.14	
October	32.0	42.9	7,900	165.13	
November	35.0	46.9	9,300	183.88	
December	38.0	50.93	11,140	204.86	.220
			77,560	$ 1,706.87	
January 1930	40.0	53.6	10,620	210.10	
February	40.00	53.6	8,580	199.90	
March	36.0	48.3	8,140	182.08	
April	36.0	48.3	8,180	182.28	
May	32.0	42.9	7,280	162.03	
June	30.0	40.2	6,260	148.85	
July	30.0	40.2	6,860	152.05	
August	31.68	42.47	7,680	162.77	
September	36.0	48.26	7,680	179.73	
October	36.0	48.26	9,480	188.73	
November	36.0	48.26	10,800	195.33	
December	39.6	53.08	15,080	220.85	
			104,640	$ 2,184.70	.209
January 1931	38.88	52.12	11,760	211.43	
February	37.44	50.19	9,720	150.57	
March	37.44	50.19	9,720	150.57	
April	37.44	50.19	8,520	150.57	
May	37.44	50.19	8,280	150.57	
June	37.44	50.19	7,180	150.57	
July	37.44	50.19	7,680	150.57	
August	37.44	50.19	7,660	150.57	
September	40.0	53.61	8,880	160.83	
October	40.00	53.61	10,660	160.83	
November	42.0	56.3	11,180	168.90	
Decemb er	46.0	61.66	13,740	184.98	
			114,980	$ 1,940.96	.169

KNAPPA-SVENSEN ELECTRIC COMPANY
STATEMENT OF POWER BILLING

Showing Kilowatt Hours, Amount Billed, Demands Established and Billing Demand by Months from September 1927 to and including July 1934.

Month	Billing Demands Kw	Hp	Kilowatt Hours Used	Amount Billed	Cost Per Kwh
January 1932	46.0	61.66	11,400	$ 184.98	
February	46.0	61.66	11,020	184.98	
March	46.0	61.66	9,440	184.98	
April	46.0	61.66	8,540	184.98	
May	46.0	61.66	7,940	184.98	
June	46.0	61.66	7,420	184.98	
July	46.0	61.66	7,540	184.98	
August	46.0	61.66	8,420	184.98	
September	46.0	61.66	8,780	184.98	
October	46.0	61.66	10,860	184.98	
November	46.0	61.66	10,980	184.98	
December	44.0	58.98	12,960	176.94	
			115,300	$ 2,211.72	.192
January 1933	42.0	56.3	13,140	168.90	
February	42.0	56.3	10,680	168.90	
March	42.0	56.3	10,380	168.90	
April	42.0	56.3	9,000	168.90	
May	42.0	56.3	8,000	168.90	
June	42.0	56.3	7,400	168.90	
July	42.0	56.3	7,960	168.90	
August	42.0	56.3	8,480	168.90	
September	42.0	56.3	9,020	168.90	
October	42.0	56.3	11,080	168.90	
November	44.0	58.98	12,820	176.94	
December	44.0	58.98	14,860	176.94	
			122.820	$ 2,043.88	.166
January 1934	44.0	58.98	13,100	176.94	
February	44.0	58.98	12,760	176.94	
March	48.0	64.34	12,860	193.02	
April	48.0	64.34	11,580	193.02	
May	48.0	64.34	11,100	193.02	
June	48.0	64.34	10,180	193.02	
July	48.0	64.34	10,640	193.02	
			82,220	$ 1,318.98	

PRESENT ELECTRICAL SERVICE (Continued)

The data contained in the following table is compiled from the annual reports submitted by the Knappa-Svensen Electric Company to the Public Utilities Commissioner of Oregon, covering the period from 1927 when the company began operations until the close of 1953. This table shows the number of kilowatt-hours purchased each year and the cost thereof, the number of kilowatt-hours unaccounted for (apparently lost in distribution) and the per cent lost, the number of kilowatt-hours sold, the total revenue from sales of electrical energy and the revenue per kilowatt-hour sold, the number of customers each year, number of kilowatt-hours consumed per customer and the revenue per customer.

KNAPPA-SVENSEN ELECTRIC COMPANY

Data on Electrical Purchases and Sales, 1927-1933

(From Annual Reports to Public Utilities Commissioner)

Year	Kilowatt Hours Purchased	Cost of Energy Purchased	Kwh unaccounted for: Number	Kwh unaccounted for: Per Cent of Total	Kwh Sold	Total Revenue From Kwh Sales	Revenue Per Kwh Sold	Number of Customers	Average Revenue Per Customer	Kwh Consumed Per Customer
1927	7,960	$ 293.60	2,074	26	5,886	$ 573.09	$0.097	96	$ 5.97	61
1928	55,360	1,391.61	21,440	40	31,920	3,725.71	0.117	148	25.20	216
1929	77,560	1,706.87	27,789	36	49,771	5,507.29	0.111	174	31.70	286
1930	104,640	2,153.76	27,640	26	77,000	7,054.30	0.092	205	34.40	376
1931	114,980	1,940.96				7,903.63		215	36.80	
1932	115,000	2,219.76	44,268	38	70,712	7,413.31	0.105	218	34.00	324
1933	123,660	2,042.88	54,588	44	69,072	7,105.45	0.103	217	32.70	318

PRESENT ELECTRICAL SERVICE (Continued)

On the following pages there are presented a number of charts. Plate B shows graphically the monthly and average annual consumption in kilowatt-hours and the 15 minute peak loads. Plate C shows the cost per kilowatt-hour and the total annual cost of electricity purchased. Plates D and E are typical summer daily load curves. These latter were taken from the record sheets of a recording meter installed in the spring of this year at the point of connection between the lines of the Pacific Power and Light Company and the Knappa-Svensen Electric Company.

PROPOSED

WICKIUP PEOPLES' UTILITY DISTRICT

ANALYSIS OF PAST USE OF ELECTRICITY IN TERRITORY

SERVED BY THE KNAPPA-SVENSEN ELECTRIC CO.

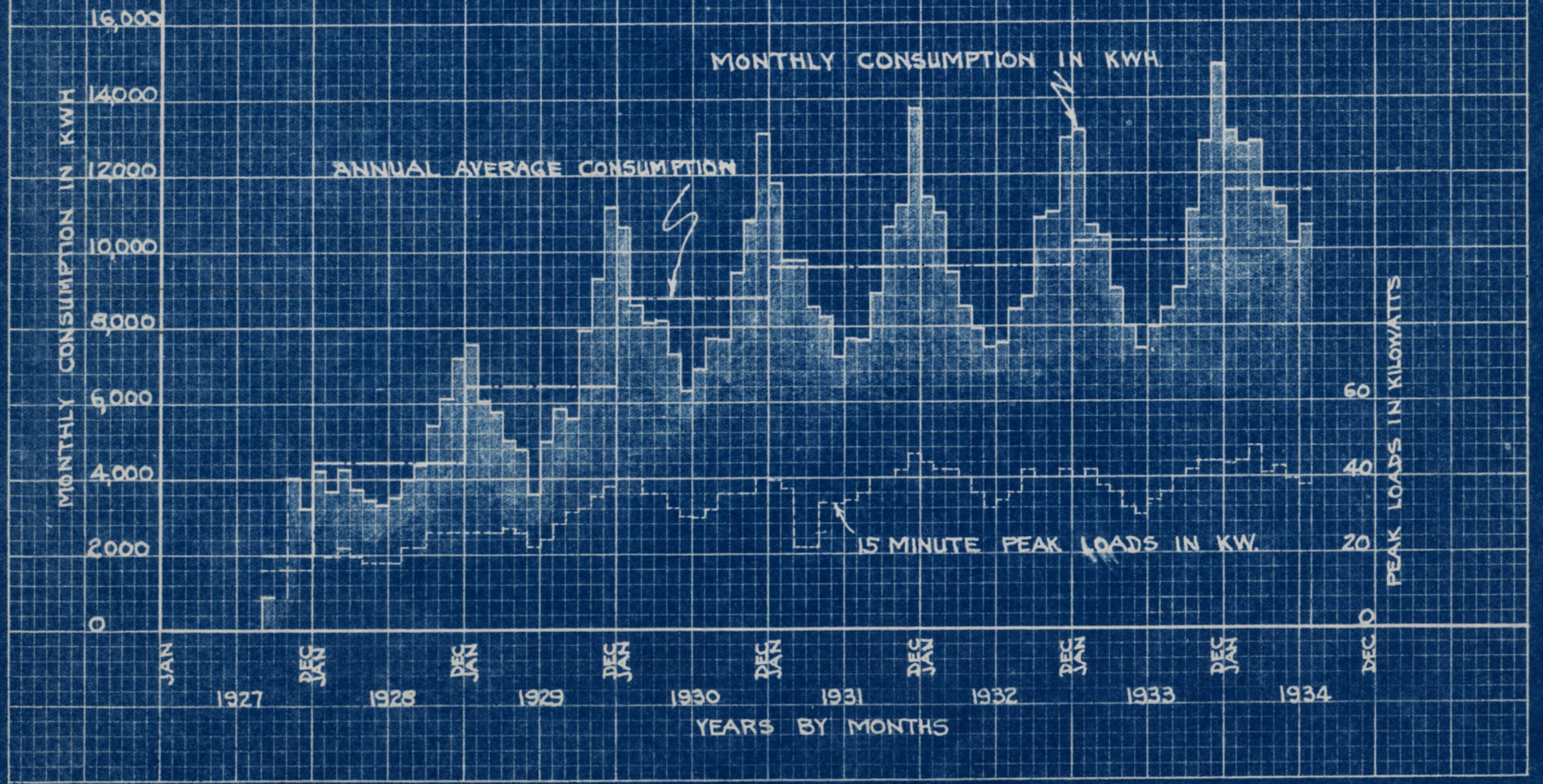


PLATE B

NO. 3164. 12 BY 10 DIVISIONS PER INCH. 120 BY 70 DIVISIONS.
CODEX BOOK COMPANY, INC. NORWOOD, MASSACHUSETTS

PROPOSED

WICKIUP PEOPLES' UTILITY DISTRICT

COST OF ELECTRICITY PURCHASED
BY THE
KNAPPA-SVENSEN ELECTRIC CO.

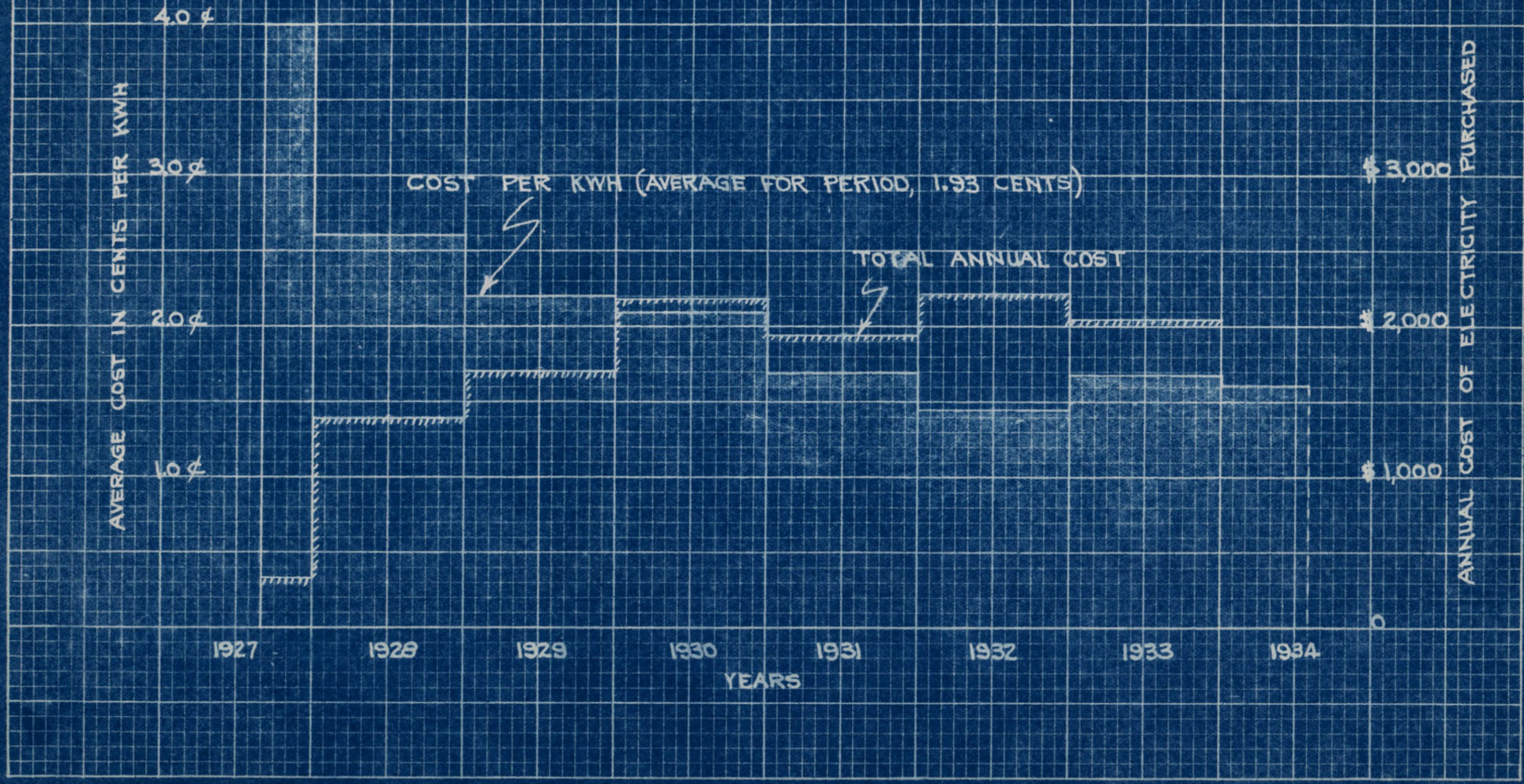


PLATE C

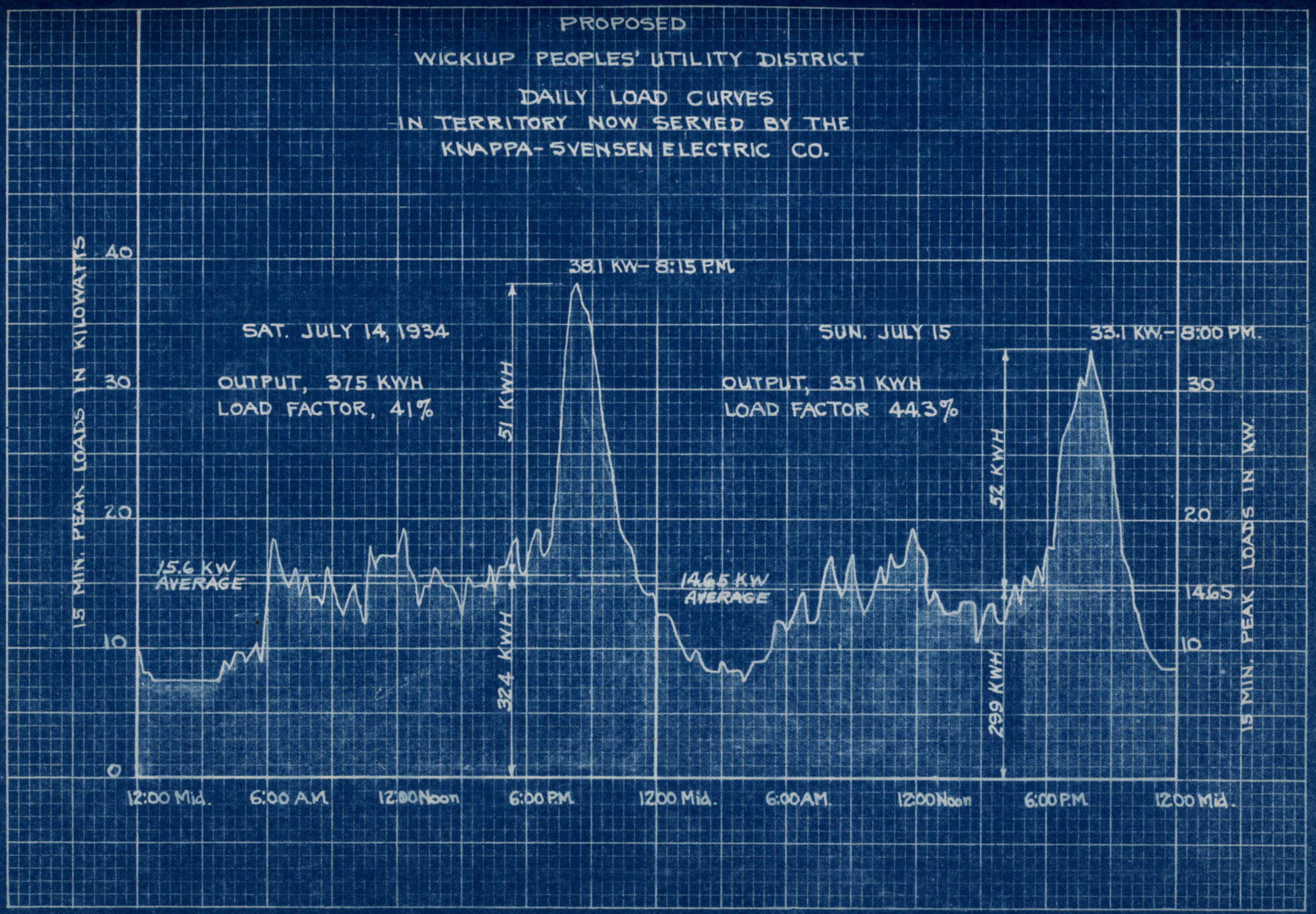

PROPOSED
WICKIUP PEOPLES' UTILITY DISTRICT
DAILY LOAD CURVES
IN TERRITORY NOW SERVED BY THE
KNAPPA-SVENSEN ELECTRIC CO.
15 MIN. PEAK LOADS IN KILOWATTS
40
30
20
10
0
SAT. JULY 14, 1934
OUTPUT, 375 KWH
LOAD FACTOR, 41%
38.1 KW- 8:15 P.M.
51 KWH
15.6 KW AVERAGE
324 KWH
SUN. JULY 15
OUTPUT, 351 KWH
LOAD FACTOR 44.3%
33.1 KW.- 8:00 P.M.
52 KWH
14.65 KW AVERAGE
299 KWH
12:00 Mid.
6:00 A.M.
12:00 Noon
6:00 P.M.
12:00 Mid.
6:00 A.M.
12:00 Noon
6:00 P.M.
12:00 Mid.
15 MIN. PEAK LOADS IN KW
30
20
14.65
10

PLATE D

PROPOSED

WICKIUP PEOPLES' UTILITY DISTRICT

DAILY LOAD CURVES
IN TERRITORY NOW SERVED BY THE
KNAPPA-SVENSEN ELECTRIC CO.

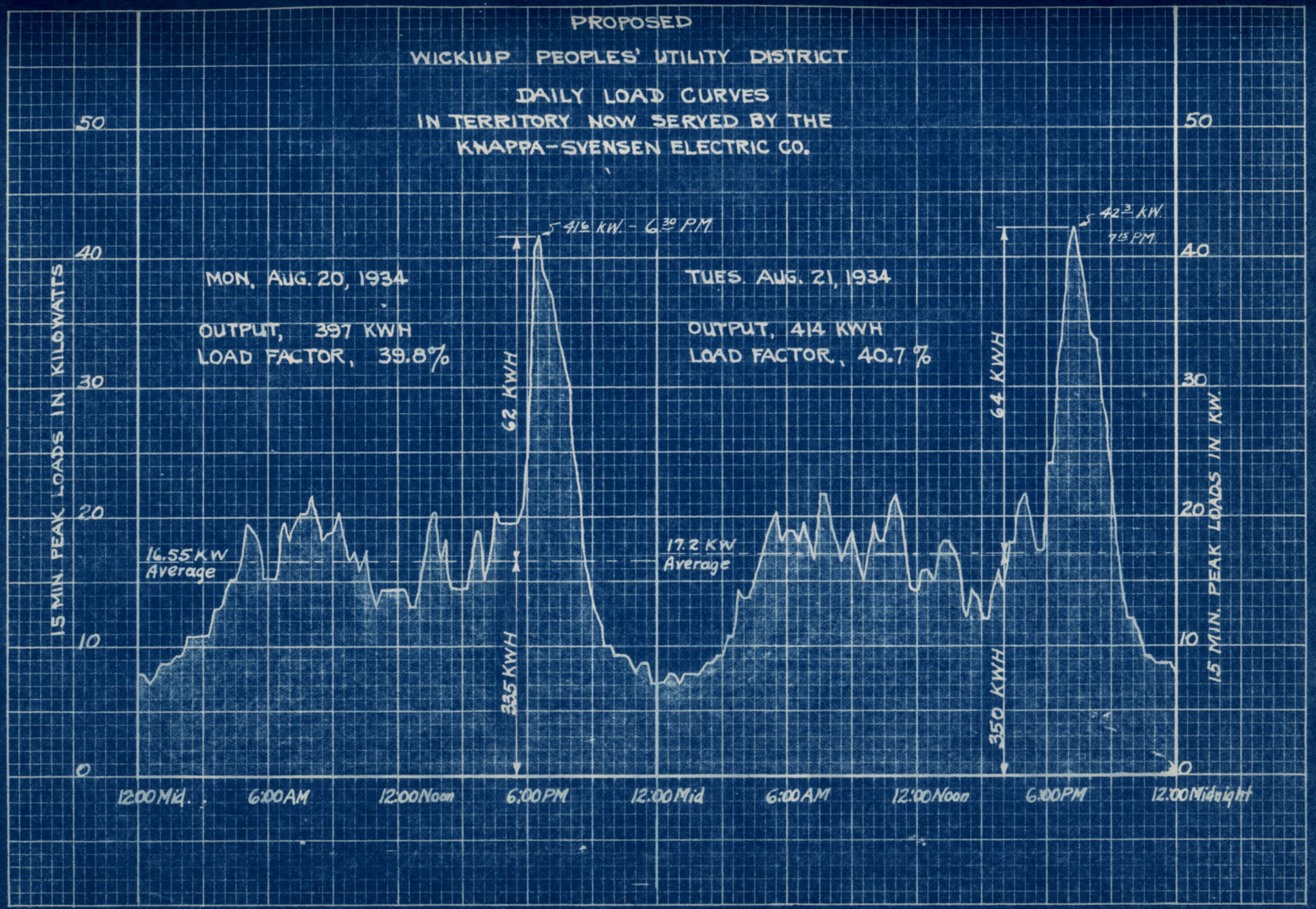


PLATE E

MARKET

The Commission's survey has shown some 437 potential customers, about 240 of which are now using electricity supplied by the Knappa-Svensen Electric Company. Residences were divided into classes A, B and C. A class A residence is a good, fairly new, modern, 5 to 7 room building; a class B is an average 4 to 6 room farm home, and a class C is a small usually unpainted, perhaps 2 to 4 room house. The following table shows the number and classification of the potential customers.

Class of Customer	Served (By Knappa-Svensen Electric Company)	Not Served
Class A residences	52	22
Class B residences	138	97
Class C residences	18	65
House boats residences	8	6
Stores	6	1
Service Stations	5	4
Churches	2	1
Schools	5	2
Auto Camp	7 cabins - 1	5 cabins - 1
Cannery	1	
Union Hall	1	
Grange Hall	2	
Boat House	1	
Totals	240	197

Of course these 437 potential customers cannot be secured 100 per cent. Many fine homes are not using the present available service, however, and it seems likely that at least 90 per cent of the homes would become customers immediately if electricity is furnished by a peoples' utility district. It is necessary to adopt some definite figure as the probable number of customers, in order to estimate the probable market for electricity. We shall, for this study, take 90 per cent of 437 or 390 as the number of customers.

The consumption per customer in this district would likely be relatively low because the farms are small and there are many small residences including houseboats, occupied by fishermen. Chicken raising and dairying are some of the most important agricultural pursuits and these offer the best load building possibilities. Practically no power market can be expected, at least in the immediate future, and unless rates are reasonable very little energy will be used for water heating and cooking.

The average number of kilowatt-hours consumed per customer in this territory in 1933 is shown by the annual report of the Knappa-Svensen Electric Company to the Public Utilities Commissioner as being 318. In some similar territory in Clatsop County, the consumption the same year was 568 kilowatt-hours per customer.

For the purpose of estimating the probable demand during the next few years and the number of kilowatt-hours which will be required each year, we estimate that at the beginning of operation of the district the consumption per customer would be 350 kilowatt-hours per year, and that this would be increased to 500 kilowatt-hours within the first few years.

Taking this figure as 500 kilowatt-hours per year and the distribution losses as 25 per cent, the total plant output or energy purchased would be $\frac{500 \times 390}{.75}$ = 260,000 kilowatt-hours per year. This is equivalent to a continuous supply of 29.7 kilowatts. Then assuming a load factor of 25%, based upon the ratio of the average demand to the momentary peak demand, the peak demand is found to be 119 kilowatts. This is equivalent to a demand of 305 watts per customer, a reasonable figure.

It must be noted that this figure of 305 watts per customer is not the actual demand at his home. It is used for determining the amount of energy needed at the generating plant or other source of power. On the basis of the foregoing assumptions, his actual demand would be 25 per cent less or 229 watts, due to losses in transmission and distribution.

For the purpose of comparison, it may be stated that the present peak demand for a 15-minute period is about 50 kilowatts, as against our estimate of 119 kilowatts for a new, publicly owned system to serve 90% of the potential customers.

Estimated Growth.

The following graph, plate F, shows the growth in amount of electricity purchased since the beginning of operations of the Knappa-Svensen Electric Company, and a projected curve as an indication of what may be expected in the way of growth during the next few years. This curve would indicate a growth of about 7.5% annually. An estimated annual growth of 7.5% for the first five years after beginning of operations by the district seems reasonable.

PROPOSED

WICKIUP PEOPLES UTILITY DISTRICT

ESTIMATE OF FUTURE USE OF ELECTRICITY

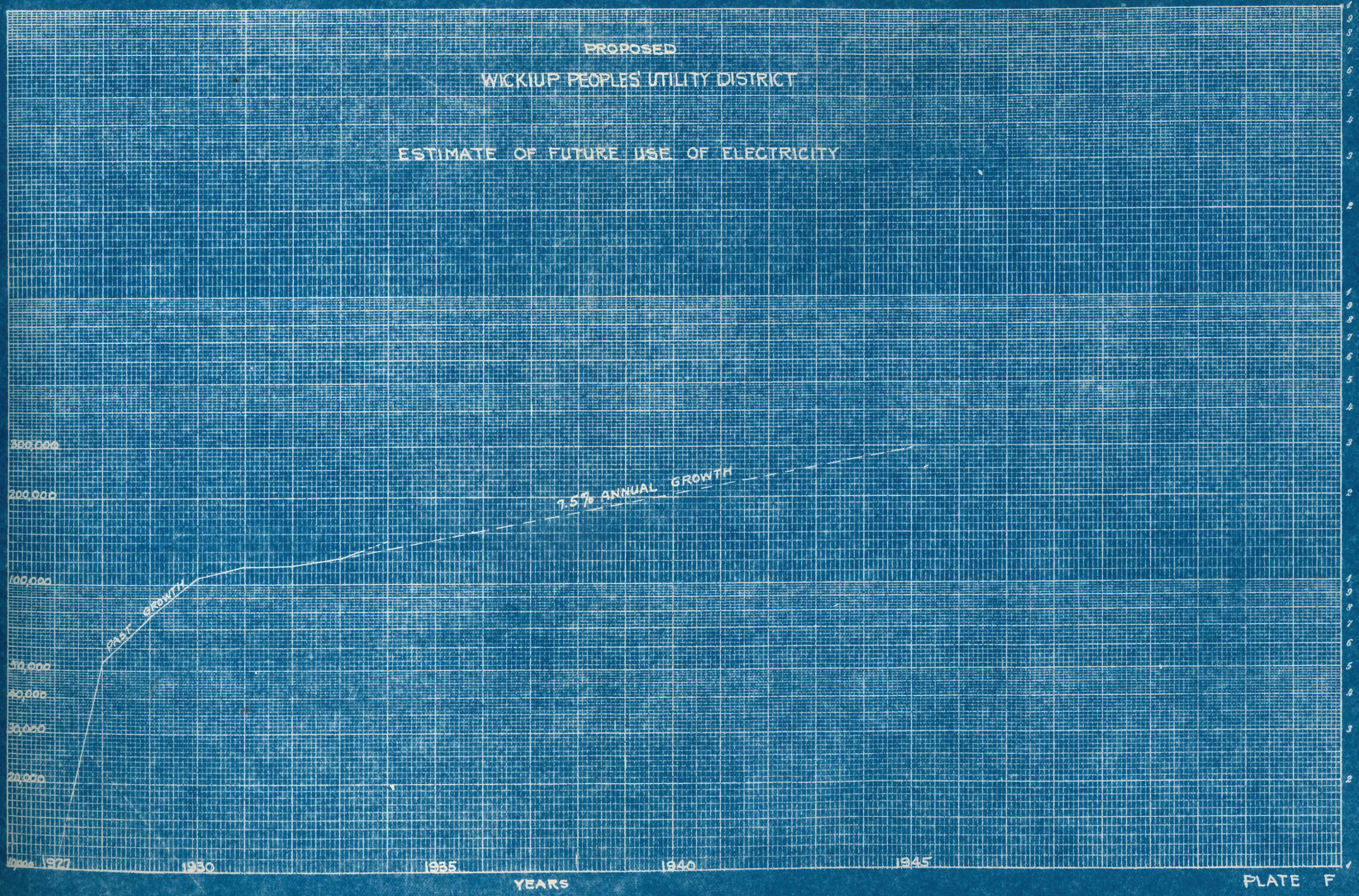


PLATE F

ESTIMATED ANNUAL INCOME

According to the 1933 report of the Knappa-Svensen Electric Company, the number of kilowatt-hours consumed per customer in that year was 318 for which he paid $32.70 or an average of 10.3 cents per kilowatt-hour. There were 217 customers, and they probably run a little better than the average will be if the district secures 90% of all potential customers in the district or about 390. It seems reasonable to assume for this study that if rates are reduced to an average of seven or eight cents per kilowatt-hour the consumption per customer will be not less than 350 kilowatt-hours per year at the start and will increase at a fairly rapid rate until it reaches 500 or 600kilowatt-hours per year.

It will be noted from the above figures of $32.70 per year paid by each customer in 1933 that his average monthly bill was $2.72. With slightly decreased rates and better service it would seem that a monthly revenue of $2.75 per customer could be depended upon. On this basis the annual income the first year would be 390 x $2.75 x 12= $12,900. This figure appears a little high.

In order to present a more conservative estimate of revenues, let it be assumed that the average charge for each kilowatt-hour sold is eight cents and the average consumption per customer is 350 kilowatt-hours per year. The consumption would then be 390 x 350 = 136,000 kilowatt-hours and the revenue 136,000 x .08 = $10,900 for the first year.

In considering these figures and comparing them with rates

and charges in other territory, it must be remembered that these charges are the only charges the customers are called upon to pay. The revenues derived by the district from these charges would be used to operate and maintain the system, purchase power and cover the annual cost of interest and debt retirement. In many cases, rural customers must pay a part of the cost of the transmission line in addition to their bills for energy used.

In the market study we have estimated an annual growth in the use of electricity of 7.5 per cent for the next five years. The revenues would be expected to increase at the same rate. Starting with $10,900 in 1937 and applying this 7½ per cent annual increase, the revenue would reach $15,600 in 1942.

ESTIMATE OF COST OF HYDRO-ELECTRIC GENERATING PLANT

Big Creek, a tributary of the Columbia River, flows northerly through the central part of the district. The stream apparently offers possibilities for development of power in sufficient quantity to supply the district at the present and for some time in the future, and, therefore, a survey was made to determine the approximate cost of a generating plant.

The section of the stream which appears most advantageous for a power project is in the vicinity of what is known as "The Gorge" in Section 35, Township 8 North, Range 7 West, W. M. In this stretch, the stream is paralleled by the logging railroad of the Crosset Western Lumber Company. The railroad grade is well constructed and of sufficient width that the pipe line could be installed along this grade, requiring very little excavation and providing excellent transportation for the pipe and other materials.

Another reason for selecting the vicinity of the gorge for the diversion point of the pipe line is that this gorge is apparently an excellent site for a small storage dam which might be constructed when the load conditions justify and after the abandonment of the logging railroad. It cannot be stated definitely how soon the railroad may be abandoned but in the opinion of some connected with the Crossett Western Lumber Company, the timber will be cut out in from seven to ten years.

Naturally, it has not been possible to determine definitely

what amount must be paid to the lumber company for the use of the railroad grade for installation of the pipe line. The probable cost of securing this right-of-way can only be estimated on the assumption that the company would be agreeable and would make no charge other than for such damages or inconveniences as might be experienced. It is believed that the pipe line could be installed so as not to interfere in any way with the stability of the railroad grade or operation of the railroad.

One of the controls in the matter of locating the proposed project is the existence of a fish hatchery which takes water from Big Creek about one mile below the gorge. If it should become necessary, the district could probably extinguish the water right for this hatchery at no great cost, but for the present, it seems advisable to locate the power house above this diversion.

The project proposed, therefore, would use a low diversion dam located at elevation 290, about 1600 feet above the gorge, and a pipe line about 7000 feet long which would follow the railroad grade to the power house site just above the hatchery diversion dam at elevation 150. If it should later become advisable to construct a storage dam at the gorge, this project would be constructed so as to utilize the same pipe line, the only change being the elimination of that part of the pipe which would lie upstream from the gorge.

Stream Flow.

As far as can be ascertained, there is no record of the flow of Big Creek, except a number of miscellaneous measurements made by the U. S. Geological Survey previous to the low water season of 1934. A tabulation of these measurements follows:

Date	Discharge	Location
October 5, 1908	2.8	Sec. 14, T. 7 N.,R. 7 W.
October 5, 1908	32	2 miles S.E. of Knappa
August 21, 1928	26.2	At Highway Bridge-Sec. 18, T. 8 N.,R. 7 W.
August 1, 1929	17.8	SE¼ Sec. 5, T. 7 N.,R. 7 W. at Crossett
May 31, 1929	67	NW¼ Sec. 29, T. 8 N.,R.7 W.
July 1, 1929	54	" " " " " " " "
August 1, 1929	30.4	" " " " " " " "
October 9, 1929	31.1	" " " " " " " "
May 19, 1930	75	" " " " " " " "
June 30, 1930	47.7	" " " " " " " "
August 4, 1930	27.4	" " " " " " " "
August 30, 1930	21.6	" " " " " " " "
May 18, 1931	65	" " " " " " " "
June 27, 1931	79	" " " " " " " "
August 17, 1931	25	" " " " " " " "
*August 30, 1934	16	At Gorge - SE¼ Sec. 33, T. 8 N.,R. 7 W.,W.M.

*Note: This measurement made by Hydroelectric Commission.

In connection with the Commission's studies, a staff gage was installed at the gorge in the SW¼ of Section 33, Township 8 North, Range 7 West, on August 30, 1934, and readings on this gage were kept until October 19th and through the extreme low water period. It happened that 1934 was a low water year so the low flow for this year should be very near the minimum to be expected at any time. Several persons who have observed the stream for many years stated that they had never seen the stage as low as this year.

The records obtained in 1934 are inconsequential except for the purpose of determining the minimum flow for this year and, therefore, will not be tabulated here. It may be stated that there was very little fluctuation between September 1 and October 19. The minimum for this period was about 15 second-feet. For the purpose of estimating the water supply for the proposed hydro-project, a minimum flow of 15 cubic feet per second seems reasonable.

Description of Water Shed.

The water shed area above the proposed diversion is approximately 30 square miles. A large percentage of this area is logged off and the balance will probably be cut over within the next few years. These logging operations may result in reducing the stream flow during the dry periods but probably not to any great extent. The low water flow is not dependent upon melting snows but principally upon ground storage.

Water Rights.

The State Engineer has issued two permits to appropriate the waters of Big Creek which permits must be considered in studying the water supply for this project. The first and most important is Permit No. 3945, issued to the Water Commission of the City of Astoria, granting 16 cubic feet per second under priority of 1918. The proposed diversion is in Section 3, Township 7 North, Range 7 West, a short distance above the diversion proposed for this project. Water would be carried in a pipe line 16.5 miles long to Astoria.

No construction work was done under this permit but it is still in good standing and must be disposed of through purchase or agreement with the city before any project can be constructed by the proposed district.

The second Permit is No. 6373, issued to Leroy W. Hickey and grants 25 second-feet for fish hatchery purposes under priority of1924. The diversion is in the SW¼NW¼ of Section 35, Township 8 North, Range 7 West. This right if exercised would take the entire low water flow of the stream. A power plant anywhere on the stream below this diversion would require that the right be extinguished. The project herein described would not conflict, however, as the power house would be above the present hatchery diversion.

Description of Proposed Project.

Diversion Dam:

The diversion dam would be a rock filled log crib structure 6 to 10 feet in height and would be approximately 50 feet long.

All of the stream flow except that required for the project would pass over the structure.

Conduit:

Because of the saving in cost and the suitable location available, wood stave pipe was selected. This pipe would be 24 inches in diameter and about 7,000 feet long. It would carry 15 second-feet of water with a head loss of about 3.11 feet per 1000 feet or a total head loss of about 22 feet.

Power House:

The power house estimated would be a timber frame structure about 14 feet by 20 feet on a concrete foundation. An advantageous site for such a structure is available on the left bank of the stream just above the fish hatchery diversion dam.

Power House Equipment:

The estimate of cost is based upon a horizontal shaft, 150 horsepower Leffel turbine, direct connected to a three phase, 2300 volt, 60 cycle, 125 kv-a generator. Following is the estimate of cost:

HYDRO PROJECT

ESTIMATE OF COST

1.	Right-of-way		$ 1,000.00
2.	Diversion dam		
	Clearing overflow area	$ 200.00	
	Excavation, 200 cu. yds. at $3.00	600.00	
	Rock fill, 125 cu. yds. at $2.00	250.00	
	Logs - 1500 lin. ft. at $0.50	750.00	
	Lumber - 20 M at $35.00	700.00	
	Drift bolts - 3000# at $0.08	240.00	
	Racks, gates, screen, etc.	500.00	3,240.00
3.	Pipe line		
	Wood stave pipe, 3000 lin. ft. of 24 inch creosoted Douglas fir, 50 ft. head, at $1.52 per ft.	4,560.00	
	Wood stave pipe, 2500 lin. ft. as above for 100 ft. head at $1.76 per ft.	4,400.00	
	Wood stave pipe, 1500 lin. ft. as above for 200 ft. head at $2.30	3.450.00	12,410.00
	Bridges		1,000.00
	Trench excavation, 7000 lin. ft. 3 ft. wide by 4 ft. deep - gives 3100 cu. yds. of which 20% is estimated solid rock and 80% common. 620 cu. yds. rock excavation at $3.50	2,170.00	
	2480 cu. yds. common excavation at $0.75	1.860.00	4,030.00
	Distributing pipe, 170 tons at $5.00	850.00	
	Laying pipe, 7000 lin. ft. at $0.20	1,400.00	
	Backfilling - included in excavation		
	Concrete anchorage - 10 cu. yds. at $10.00	100.00	2,350.00
	Carried Forward		$ 24,030.00

	Brought Forward		$ 24,030.00
4.	Power House		
	Timber frame building, 14 ft. x 20 ft. on concrete foundation -		
	Excavation		
	30 cu. yds. common at $0.75	$ 23.00	
	50 cu. yds. rock at $2.50	125.00	
	Concrete foundations for building and equipment -		
	15 cu. yds. at $20.00	300.00	
	Reinforcing steel, 1000# at $0.06	60.00	
	Timber frame building	300.00	
	Crane	150.00	
	Water supply, lavatory, office	200.00	1,158.00
5.	Turbine		
	150 horsepower, scroll case horizontal turbine, with shafting, coupling for direct connection to generator, foundation plate, 10 ft. draft tube, oil pressure governor and gate valve, installed		6,000.00
6.	Generator		
	125 kv-a, 0.8 power factor, 3 phase 60 cycle, 2400 volt alternator, 1200 r.p.m. with direct connected exciter installed		1,700.00
7.	Switchboard		
	Complete equipment for manual starting and automatic operation, installed		1,200.00
	Total		34,088.00
8.	Engineering and contingencies, 15%		5,113.00
9.	Interest during construction, 5% for 6 months on $25,000		625.00
	Total Estimated Cost.....		$ 39,826.00
	Say		$ 40,000.00

ESTIMATE OF COST OF TRANSMISSION AND DISTRIBUTION SYSTEM

Electricity for this district may be generated at a hydro plant located on Big Creek in the southern part of Section 29, Township 8 North, Range 7 West, W.M., or purchased from the Pacific Power and Light Company at Astoria. The system for which an estimate of cost is given would be practically the same, regardless of the source of power, except that nothing is allowed for construction of lines to bring power to the district from any source other than those mentioned.

This system would reach practically every occupied house within the district - about 437. This figure does not include some small shacks and houseboats or the houses within territory which the Commission is recommending be not included in the district. There would be 53 miles of 6900 volt, single phase line and about 15 miles of secondary 120 volt lines strung on the primary poles. Lengths of all lines were scaled from the aerial map of the district and checked by a log of the roads by automobile speedometer.

The voltage at the hydro plant or at Astoria would be 2300 and would have to be stepped up to 6900 in either case. At some future date, when load conditions justify, the voltage on the main line should be increased to 11,500 or a third conductor added and the system changed to 3 phase.

35 foot and 40 foot cedar poles were selected as fir poles are very short lived in this region. These would have to be hauled by truck from 75 to 125 miles or perhaps taken to the district by water. Trucking is probably the cheapest and most satisfactory as the poles could be unloaded at convenient points for distribution to the holes.

Aluminum cable, steel reinforced, is estimated for all primary and secondary conductors, except services where double braid weatherproof copper would be used. Copper conductors could be substituted but the cost would be slightly greater.

No allowance is made in the estimate for cost of rights-of-way. Very little of the line would be located on private property and it seems likely that any charge for this item which the district would be required to pay would be small. The allowance for contingencies should be sufficient to cover any possible charges.

In making this estimate, the existence of the system of the Knappa-Svensen Electric Company which serves a part of the district is totally disregarded, it being the purpose to show the cost of a complete, new, modern system to serve the entire territory. It should be pointed out that the estimate is on the basis of serving 437 customers and any material reduction of this number would reduce the cost to some extent.

Following is the estimate of cost:

ESTIMATE OF COST

6900 Volt, single phase system, including secondaries and services.

Materials

Poles	
140, 40-ft. cedar poles at $4.50	$ 630.00
560, 35-ft. " " " 4.00	2,240.00
100, 30-ft. " " " 3.40	340.00
Cross-Arms	
75 primary double arms equipped with steel pins and insulators at $3.90	292.00
120 primary double arms, equipped with insulated clevises at $3.10	372.00
505 primary single-arms, complete with steel pins & insulators at $1.75..	884.00
174 secondary single arms with pins and insulators at $1.60.....	278.00
106 secondary single arms with insulated clevises at $1.85	196.00
Brackets for services	
200 wood insulators brackets with insulators, at $0.17	34.00
Guys	
290 down guys complete at $3.15	913.00
Conductors	
Primary	
106 miles of No. 2 ACSR, weight per mile, 486 pounds - 51,516# at $0.174	8,964.00
Plus 2% for wastage	179.00
Plus 5% for clamps, armor wire, tie wire, twisting joints, all fittings	448.00
Secondary	
15 miles of No. 4 ACSR, weight per mile, 306# = 4590# at $0.19	872.00
Plus 7% as above	61.00
Services	
15 miles of No. 6 DBWP copper, weight per mile, 528# = 7920# at $0.208	1,647.00
10 miles of No. 8 DBWP copper, weight per mile 348# = 3480# at $0.213	741.00
Carried forward	$ 19,091.00

Estimate of Cost (Continued)

Materials (Continued)	Brought Forward	$ 19,091.00
Transformers - All single phase		
6900 - 230-115 volt		
99-1½ kv-a at $58.12		5,752.00
61-3 kv-a at $74.60		4,551.00
4-5 kv-a at $92.50		370.00
2300 - 6900 volt		
1-100 kv-a		594.00
Primary Cut-outs		
328 box type, at $7.80		2,558.00
Line Fuses		
18 open type at $9.50		171.00
2 reclosing circuit breakers at $100		200.00
Transformer Grounds		
165 including rod, clamp, and wire at $1.85		305.00
House Knobs		
900 at $0.1035		93.00
Meters		
345 at $11.00		3,795.00
TOTAL FOR MATERIAL	$	37,480.00

Labor

Clearing right-of-way - 5 men at $4.00 each, 90 days	$ 1,080.00
Loading, hauling and distributing poles to holes, 800 at $1.00	800.00
Digging holes for poles, 800 at $1.00	800.00
Digging holes, setting and backfilling anchors, 290 at $1.40	406.00
Raising and tamping poles, 800 at $1.50	1,200.00
Roofing, gaining and boring poles, 800 at $0.25	200.00
Cross-arming, 195 double arms at $0.70	137.00
Cross-arming, 785 single arms at $0.40	314.00
Guying poles to anchor rods, 290 at $0.75	217.00
Stringing and tying wire, 920 spans at $3.25	2,990.00
Hanging transformers, 167 at $3.50	584.00
Running house services and setting meters, 435 at $4.00	1,740.00
Use of truck, 200 days at $8.00	1,600.00
Construction foreman, 200 days at $8.00	1,600.00
Workmen's compensation, 5% of $12,000	600.00
Total Labor	$ 14,268.00

Total

Material	$ 37,480.00
Labor	14,268.00
Total	$ 51,748.00
Engineering and contingencies, 15%	7,762.00
Interest during construction, 5% for 6 months on $40,000.00	1,000.00
Total Estimated Cost	$ 60,510.00
Say	$ 60,000.00

Cost per mile, $\frac{\$60,000.00}{55}$ = $1,132.00

Cost per customer $\frac{\$60,000.00}{437}$ = $137.00

ANNUAL COSTS

In its conclusions and recommendations to follow, the Commission concludes that the district, if formed, should not plan to install a hydro generating plant in the immediate future. For that reason, the estimated annual costs of debt retirement and interest and operation and maintenance are based upon the cost of the distribution system only. This cost is estimated at $60,000.

Debt Retirement and Interest.

The Peoples' Utility District law under which this district would be organized requires that bonds shall run for a period not exceeding 30 years and that every issue of bonds will be in serial form so as to mature in numerical order in approximately equal annual instalments of principal and interest during the life of such bonds. The law also provides that interest only shall be payable the first four years and payments on the principal will begin on the fifth year. On the following pages we present schedules showing the annual payments required for interest and debt amortization on the basis of payments of interest only during the first four years and retirement of the bonded debt during the following twenty-six years. This statement shows that with an interest rate of 4 per cent the interest payments the first four years would be $2,400.00 per year and the annual payments of principal and interest would be approximately $3,754.00 from the fifth year to the thirtieth year. With interest at 5 per cent, the interest payments the first four years would be $3,000.00 and the annual payments of principal and interest would be approximately $4,174.00 from the fifth to the thirtieth year.

Schedule showing annual payments required for retirement of indebtedness in amount of $60,000 in 30 years, 4% interest, interest only payable first four years. Assume bonds issued January 1, 1936, denominations $500 and $1,000.

Beginning of Year	Bonds Outstanding	ANNUAL PAYMENTS		
		Interest	Principal	Total
1936	$ 60,000	$	$	$
1937	60,000	2,400		2,400
1938	60,000	2,400		2,400
1939	60,000	2,400		2,400
1940	60,000	2,400		2,400
1941	60,000	2,400	1,500	3,900
1942	58,500	2,340	1,500	3,840
1943	57,000	2,280	1,500	3,780
1944	55,500	2,220	1,500	3,720
1945	54,000	2,160	1,500	3,660
1946	52,500	2,100	1,500	3,600
1947	51,000	2,040	1,500	3,540
1948	49,500	1,980	2,000	3,980
1949	47,500	1,900	2,000	3,900
1950	45,500	1,820	2,000	3,820
1951	43,500	1,740	2,000	3,740
1952	41,500	1,660	2,000	3,660
1953	39,500	1,580	2,000	3,580
1954	37,500	1,500	2,000	3,500
1955	35,500	1,420	2,500	3,920
1956	33,000	1,320	2,500	3,820
1957	30,500	1,220	2,500	3,720
1958	28,000	1,120	2,500	3,620
1959	25,500	1,020	3,000	4,020
1960	22,500	900	3,000	3,900
1961	19,500	780	3,000	3,780
1962	16,500	660	3,000	3,660
1963	13,500	540	3,000	3,540
1964	10,500	420	3,500	3,920
1965	7,000	280	3,500	3,780
1966	3,500	140	3,500	3,640
		$ 47,140	$ 60,000	$ 107,140

Schedule showing annual payments required for retirement of indebtedness of $60,000 in 30 years, 5% interest, interest only payable first four years. Assume bonds issued January 1, 1936, denominations $500 and $1,000.

Beginning of Year	Bonds Outstanding	ANNUAL PAYMENTS		
		Interest	Principal	Total
1936	$ 60,000	$	$	$
1937	60,000	3,000		3,000
1938	60,000	3,000		3,000
1939	60,000	3,000		3,000
1940	60,000	3,000		3,000
1941	60,000	3,000	1,000	4,000
1942	59,000	2,950	1,500	4,450
1943	57,500	2,875	1,000	3,875
1944	56,500	2,825	1,500	4,325
1945	55,000	2,750	1,500	4,250
1946	53,500	2,675	1,500	4,175
1947	52,000	2,600	1,500	4,100
1948	50,500	2,525	1,500	4,025
1949	49,000	2,450	2,000	4,450
1950	47,000	2,350	1,500	3,850
1951	45,500	2,275	2,000	4,275
1952	43,500	2,175	2,000	4,175
1953	41,500	2,075	2,000	4,075
1954	39,500	1,975	2,500	4,475
1955	37,000	1,850	2,000	3,850
1956	35,000	1,750	2,500	4,250
1957	32,500	1,625	2,500	4,125
1958	30,000	1,500	3,000	4,500
1959	27,000	1,350	3,000	4,350
1960	24,000	1,200	3,000	4,200
1961	21,000	1,050	3,000	4,050
1962	18,000	900	3,000	3,900
1963	15,000	750	3,500	4,250
1964	11,500	575	3,500	4,075
1965	8,000	400	4,000	4,400
1966	4,000	200	4,000	4,200
		$ 60,650	$ 60,000	$ 120,650

Operation.

The annual cost of operation is estimated as $5,000.00 as follows:

Office rent	$ 100.00
Office supplies and equipment	200.00
Bookkeeping, billing and annual audit	1,200.00
Expenses of directors	500.00
Operation of Car	500.00
Salary of Secretary-Manager	2,400.00
Total Cost	$ 4,900.00
Say	$ 5,000.00

Maintenance or Repair.

It is estimated that five per cent of the construction cost should be set aside annually to provide for maintenance and replacement on the system. The annual cost of this item is five per cent of $60,000 or $3,000.

Purchase of Power.

Power for this project may be purchased from the Pacific Power and Light Company at Astoria. It is available at the eastern city limits at 2300 volts and could be supplied at 11,000 volts by construction of about one additional mile of line.

Without definite knowledge concerning the probable load factor for this territory, this company is not in position to make a commitment as to the rate at which electricity would be furnished. It was, however, suggested by the company that a reasonable estimate for use in this report would be the rate per kilowatt-hour at which power is now being sold to the Knappa-Svensen Electric

Company. That figure for 1935 is about 1.65 cents. A deviation of a four or five mills, up or down would make little difference in the financial setup.

It was estimated in the market study for this report on Page 19 that the number of kilowatt-hours required per customer for the first year would be 350 and distribution losses 25%. On this basis, the energy purchased would be $\frac{350 \times 390}{.75}$ = 182,000 kilowatt-hours. At 1.65 cents per kwh, the cost for the first year would be $3,000. The annual cost would increase at the rate of 7½ per cent per year.

Summary of Annual Costs.

Based upon the foregoing data we present the following table summarizing the annual costs for the first few years in accordance with the Commission's estimate of probable growth.

SUMMARY OF ESTIMATED INCOME AND ANNUAL COSTS

Year	Estimated Income	ANNUAL COSTS: Interest and Amortization	Operation	Purchase of Power	Total Annual Costs	Reserve Available for Maintenance
1936	$	$	$	$	$	
1937	1/10,900	2,400	5,000	2/3,000	10,400	500
1938	11,720	2,400	5,000	3,220	10,620	1,100
1939	12,600	2,400	5,000	3,470	10,870	1,730
1940	13,540	2,400	5,000	3,740	11,140	2,400
1941	14,540	3,900	5,000	4,020	12,920	1,620
1942	15,630	3,840	5,000	4,310	13,150	2,480

1/ 136,000 kwh at 8 cents, 7½% annual growth.

2/ On basis of 182,000 kwh at 1.65 cents, 7½% annual growth.

CONCLUSIONS

1. Cost.

The foregoing report shows that in this territory which would be formed into the Wickiup Peoples' Utility District there are about 457 potential users of electrical energy, and a complete modern transmission and distribution system to serve all of these customers can be constructed at a cost of approximately $60,000.00. It further shows that it is reasonable to anticipate sufficient revenues from that portion of these potential consumers which would become actual purchasers of electricity to pay interest at 4% or 5% and amortize an indebtedness of $60,000.00 in a period of 26 years; to operate and maintain the system; to purchase power sufficient for the district's needs if it can be purchased at Astoria at the approximate rate per kilowatt-hour which is being paid by the present utility; and to set aside an allowance for maintenance and replacement of the system to keep it in good working condition.

2. Acquisition of Existing Utility.

The territory is now served by a public utility corporation which serves some 54 per cent of the 457 potential customers. Poles, wires, and other electrical equipment now in use could largely be utilized and made a part of the new system. If the district should be formed and should proceed in the construction of its own system, the Commission is of the opinion that a bona fide effort should be made to acquire the present system or so much thereof as may be of value.

3. Hydroelectric Plant.

Although there exists on Big Creek, adjacent to the district, a site for a hydroelectric generating plant of sufficient capacity to supply the district, it is the judgment of the Commission that the construction of such plant should not be undertaken in the immediate future. The annual cost of operating and maintaining the hydro plant and of interest on the required investment would probably exceed the annual cost of purchased energy, at least for the first few years.

4. District Boundaries.

The district boundaries as described in the voters' preliminary petitions filed with the Commission include some territory which is not inhabited and some which although sparsely inhabited cannot be economically served with electricity. The Commission, therefore, recommends a change of the district boundaries to eliminate all of Section 6, Township 8 North, Range 7 West, W. M., and all that part of Sections 5 and 7 in said Township, lying north of Blind Slough. In other words, the Commission recommends that the description of a portion of the north boundary of the district which now follows the north line of Sections 5 and 6 and the west line of Sections 6 and 7 in Township 8 North, Range 7 West, W. M., be changed to follow the meander lines on the south and east of Prairie Channel and Blind Slough from the north line of said Section 5 to the west line of said Section 7.

5. Advisability of Creating District.

The figures presented indicate that it is feasible for the

people of this district to own and operate their own system and supply themselves with electric energy. The system for which cost figures are given would give better and wider service than that now available but would not hold out a promise of any immediate material reduction in rates.

At the hearing held by the Commission on September 14, 1934, those sponsoring the formation of the district stated a desire to complete the organization so as to be in readiness to secure power from Bonneville if and when it is available. While the Commission is not advised and therefore cannot advise the sponsors concerning the availability and cost of such power, it is possible that the people of the territory would be in a better position to negotiate for this or other power through the medium of the district.

Respectfully submitted,

HYDROELECTRIC COMMISSION OF OREGON

A. J. Derby, Chairman

Chas. E. Strieklin, Secretary

WICKIUP PEOPLES' UTILITY DISTRICT

MAP COMPILED FROM AERIAL PHOTOGRAPHIC SURVEY

BY THE

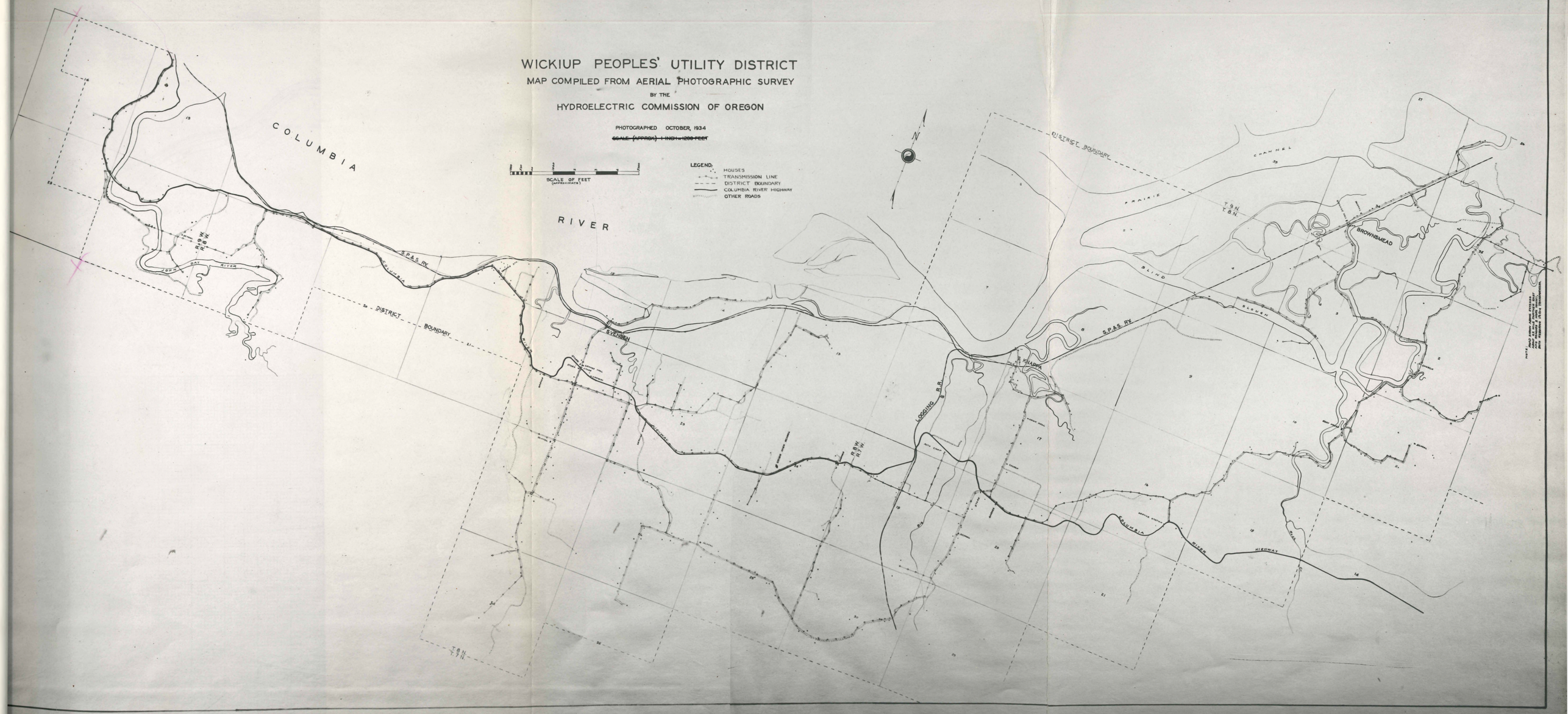
HYDROELECTRIC COMMISSION OF OREGON

PHOTOGRAPHED OCTOBER, 1934

~~SCALE (APPROX.) 1 INCH = 1200 FEET~~

SCALE OF FEET (APPROXIMATE)

LEGEND:
- HOUSES
- TRANSMISSION LINE
- DISTRICT BOUNDARY
- COLUMBIA RIVER HIGHWAY
- OTHER ROADS

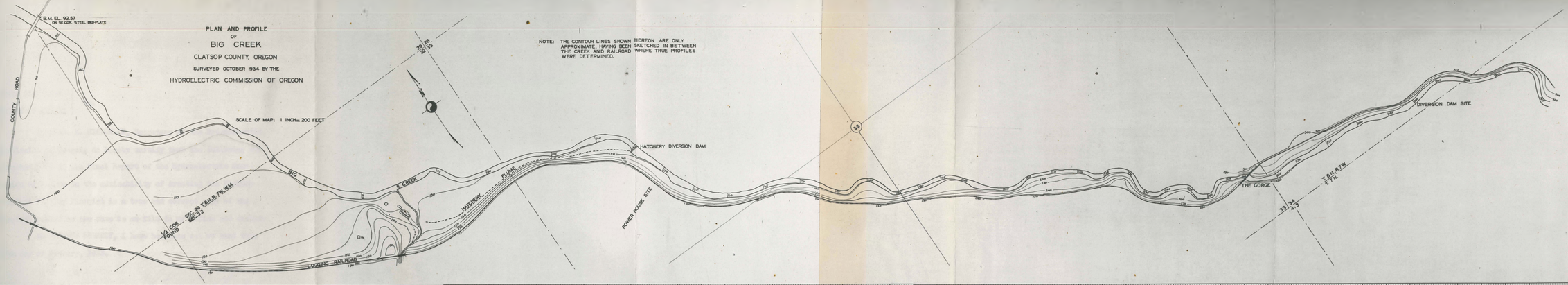


PLAN AND PROFILE OF BIG CREEK

CLATSOP COUNTY, OREGON

SURVEYED OCTOBER 1934 BY THE HYDROELECTRIC COMMISSION OF OREGON

NOTE: THE CONTOUR LINES SHOWN HEREON ARE ONLY APPROXIMATE, HAVING BEEN SKETCHED IN BETWEEN THE CREEK AND RAILROAD WHERE TRUE PROFILES WERE DETERMINED.



SCALE OF PROFILE:
HOR. 1 INCH = 200 FEET
VER. 1 INCH = 50 FEET